



## OFFICE MEMORANDUM

**DATE:** July 29, 1996

**TO:** District Engineers  
District Field Engineers  
District Construction Engineers  
Resident/Project Engineers  
District Traffic and Safety Engineers

**FROM:** Paul F. Miller Calvin Roberts  
Engineer of Construction Engineer of Materials and Technology

**SUBJECT:** Joint Construction and Materials and Technology  
Instructional Memorandum 1996-G:  
Expanded Use of Solar Assist Arrow Boards and  
LED Warning Lights

Construction Instructional Memorandum 1996-2 dated April 3, 1996, is hereby revoked and superseded by this memorandum

### Solar- Assist Arrow Boards

A review of the performance of solar assist arrow boards during the construction season to date was conducted by the Construction Zone Advisory Committee (CZAC). Results of day and night time reviews conducted by the construction zone review team, traffic and construction staff from District 7, CZAC members, the FHWA, and other department employees indicate that the latest generation of solar assist arrow boards provide satisfactory visibility and legibility distances, and the angularity is adequate when approaching from adjacent lanes. In addition, many surrounding states have switched completely to solar assist arrow boards with no apparent problems.

Therefore, effective immediately, the use of solar assist arrow boards is being expanded to allow the resident/project engineers the option to substitute solar assist arrow boards in lieu of diesel arrow boards on all projects under their authority. No price adjustment will be made for substituting solar assist boards for diesel arrow boards. The solar assist arrow boards proposed for use must meet the criteria outlined in the attached Special Provision to qualify for field application. A Recommendation/Authorization Form 1100 is required to make this change.

The expansion of this test and further review of these devices will help form a final recommendation on future use of solar assist arrow boards. Any problems with these devices should be communicated immediately to Materials and Technology Division, Chemical Technology Unit.

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**LED Warning Lights**

The Construction Zone Review Team along with district personnel, members from Traffic and Safety and M&T have reviewed many field applications of LED warning lights. Early reports indicate that LED lights provide satisfactory visibility and adequate angularity. There have been no complaints to date about their performance.

As a result of these findings, the Engineering Operations Committee has agreed to expand the use of LED lights; and allow Project Engineers the option to substitute LED lights in lieu of incandescent lights on all projects under their authority. No pay adjustments will be made for substituting LED lights for incandescent lights. The LED lights proposed for use must meet the criteria outlined in the attached Special Provision to qualify for field application. A Recommendation/Authorization Form 1100 is required to make this change.

The expansion of this test and further review of these devices will help form a final recommendation on future use of LED lights. Any problems with these devices should be communicated immediately to Materials and Technology Division, Chemical Technology Unit.

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Engineer of Construction

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Engineer of Materials and Technology

PFM:AQS:RL:hr  
attachments

cc:   Lansing Construction Engineers  
      Lansing Construction Division Technicians  
      Engineering Services Division  
      M&T Division  
      Design Division  
      Traffic and Safety Division  
      OEO  
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**Subject Index:   Traffic Control**

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS

**SPECIAL PROVISION  
FOR**

**SOLAR-ASSIST ARROW BOARDS**

**CONST:RGL**

**1 OF 2**

**7-24-96**

**CD:APPR:AQS:PAL:7-24-96**

**a. Description:** This special provision describes the requirements and operating limitations for solar-assist arrow boards furnished for traffic control in work zones. The solar-assist arrow board shall consist of an arrow board, controller, and power supply, all mounted on a heavy duty towable trailer.

**b. Materials:** The materials shall meet the requirements of MMUTCD Part VI, 6E-9, in addition to the following requirements:

**1.** The arrow board shall be a nominal 96 inches x 48 inches with 15 LED lamps. Lamp brightness shall be maintained at near 100% for all power conditions above power failure. Arrow boards shall not have full reflectors behind the lamps. The color presented by the elements shall be yellow. There shall be an easy means to measure and monitor the battery charge level and the solar charging level. There shall be a photocell for autodimming. There shall be no way to override the autodim feature. There shall be a sighting device for proper arrow board alignment with the roadway.

**2.** The solar-assist arrow board shall have a minimum legibility of 0.7 miles when viewed from perpendicular to the arrow board face. It shall have a minimum legibility of 0.5 miles when viewed at all angles out to 15 degrees from perpendicular to the arrow board face, both sides of center. When installed, the arrow shall remain clearly legible at all distances from 0.5 miles to within 200 feet of the arrow board from all lanes of traffic and from all roadway entrances. All legibility distances shall be verified on a sunny day and a clear night.

NOTE: The solar-assist arrow boards shall not be placed on any horizontal or vertical curve which might interfere with these legibility requirements.

**3.** The control cabinet shall have a lockable door. Connections to control cabinets and sign board shall be according to the National Electric Code 400-10 and 400-14. External electrical wiring shall comply with the International Municipal Signal Association wiring and cable specifications 20-1, 20-2, 20-5, and 20-6.

**CONST:RGL**

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**7-24-96**

4 The power supply to the sign shall be battery with solar backup. Solar-assist arrow boards must be capable of operating for 30 consecutive days without sun in single arrow mode and have a built-in 110 VAC battery charger.

5. The trailer shall be highway orange and shall be delineated with a 18" x 2" strip (or equivalent) of reflectorized red and white vehicle conspicuity tape installed on each of the four (4) sides. The bottom of the sign panel shall be 7 feet above the roadway when it is in operating mode.

**c. Required Testing and Documentation.**-The contractor shall supply independent laboratory test data on the specific lamps/LEDs used in the solar-assist arrow board. The test data shall include photometric testing for luminous intensity of the lamp from 0,0 degrees to plus and minus 20 degrees horizontal and to plus and minus 6 degrees vertical in a maximum of 2 degree increments. The lamps shall be tested at 100% battery voltage and at a setting comparable to the autodim mode. Copies of the test data shall be submitted to the project engineer and to MDOT, M & T Division, Chemical Technology Unit at least one week prior to field use of the arrow board. The data submitted should include an identification of the specific project and the project engineer. The contractor shall supply written certification to the engineer that all the testing and requirements herein are met or exceeded prior to field use of the arrow board.

**d. Measurement and Payment.**-The completed work as measured for Solar-Assist Arrow Board will be paid for at the contract unit price for the following contract items (pay items).

<b>Contract Item ( Pay Item )</b>	<b>Pay Unit</b>
Lighted Arrow, Solar-Assist, Furnished . . . . .	Each
Lighted Arrow, Solar-Assist, Operated . . . . .	Each

Lighted Arrow, Solar-Assist, Furnished shall include furnishing the item in operable condition and initially placing into position.

Lighted Arrow, Solar-Assist, Operated shall include operating, maintaining, relocating and protecting the board.

**MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS**

**SPECIAL PROVISION  
FOR  
LIGHT EMITTING DIODE (LED)  
WARNING LIGHTS**

**1 OF 1**

**CD:AQS:hr** .....

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**7/30/96**

**CD:APPR:RGL:PAL:8/1/96**

**a. DESCRIPTION:** ..... This special provision describes the requirements for Light Emitting Diode (LED) Warning lights (Type A and Type C) which may be used on channelizing devices, barricades and signs in place of conventional incandescent warning lights at the option of the Project Engineer. LED lights and conventional incandescent lights shall not be intermixed on the same project.

**b. MATERIALS:** ..... The materials shall meet or exceed all requirements for Type A and Type C warning lights as outlined in the current edition of the Michigan Manual of Uniform Traffic Control Devices, the Standard Specifications for Construction and MTM 701.

**c. REQUIRED TESTING AND DOCUMENTATION:** ..... Testing shall be performed in accordance with MTM 701 except that the capability of a light to meet specifications will be based on a clean condition. The manufacturer or contractor shall supply independent laboratory test data on the specific make and model of LED lights proposed for use. Copies of the test data shall be submitted to the project engineer and MDOT's M&T Division, Chemical Technology Unit at least one week prior to field use of LED lights. The contractor shall also supply the engineer with written certification that all of the above referenced requirements and specifications are met and/or exceeded prior to field use of the proposed LED lights. There will be no substitutions. Only those makes and models properly documented as passing above criteria and specifications will be allowed for use.

**d. MEASUREMENT AND PAYMENT:** ..... The completed work for LED Warning Lights (Type A/Flashing and Type C/Steady-Burn) will not be measured or paid for separately but shall be included in the measurement and payment of appropriate contract items (pay items) listed.